RANDOM WALK IN A SPARSE RANDOM ENVIRONMENT

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We'll investigate a nearest neighbour random walk $(X_n)_n$ on the set of integers with random transition probabilities. The random walk moves symmetrically with exception of some random, marked sites, where a random drift is imposed. We assume that the distance between the marked sites are independent copies of a given random variable $\xi \in \mathbb{N}$ and that at each marked site the random walker jumps to the right with probability being an independent copy of a given random variable $\lambda \in (0, 1)$.

If the distance between the marked sites ξ is of finite mean, the asymptotic behaviour of the random walker resembles that in the classical case [3]. Roughly speaking

$$\frac{X_n}{n^\alpha}$$

converges in distribution to a law related to a stable distribution [4, 2], where the value of the parameter $\alpha \in (0, 1]$ as well as the parameter of the stable distribution are determined by the distributions of ξ and λ.

The complementary case, when distance between the marked sites is of infinite mean, reveals new behaviour. Here $(X_n)_n$ scales like a simple symmetric random walk, that is

$$\frac{X_n}{\sqrt{n}}$$

converges in distribution. However the corresponding limit distribution is non-stable [1].

References

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